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Physics and Industry

A Memorandum on Post-War Education and Training of Physicists, prepared by Dr. H. Lowery, Principal of the South-West Essex Technical College, at the request of the Planning Committee of the Institute of Physics, makes interesting reading for foundrymen, because of the increasing use which is being made of this science by the industry. In the patternshop there are measuring instruments for dimensional accuracy and the moisture content of timber; for melting, a large range of apparatus for testing volume, pressure and temperature; the tools of the sand laboratory are largely of a physical character, whilst the same remark applies to the general control and final testing of castings. The drive for fuel economy is being undertaken very largely by the metallurgical staffs of the larger concerns. They are mentally well equipped for this job, but for the fundamental work of designing for efficiency, the physicist's advice is worth seeking. According to Dr. Lowery there are four grades of physicists: (I) The pioneer physicists who are somewhat remote from industry. (II) Developmental physicists, "who, given a physical idea, will be required to consider its possible adoption as a basis for factory operations." (III) Liaison physicists, whose job it is to correlate the work of the research laboratory with that of the factory, with a view to securing the highest possible efficiency from the plant. (IV) Inspector physicists—men who assist in the control of factory operations without necessarily interpreting the results of their observations. This nomenclature is different from what has been currently used in the foundry industry. Grade II would be called a "research physicist," and Grade III a development physicist or officer. A few large foundries employ Grades II to IV and many the last two categories, though much of the work is carried out by men trained not as physicists but as metallurgists either by courses taken at a modern university or in the hard school of the works laboratory supplemented by evening school study. The increasing entry of Grade II is confidently anticipated. Some years ago we made a complete *volte-face* in our views on education and expressed ourselves in favour of an uninterrupted purely academic training for future works executives, leaving any industrial bias to the post-graduate period and this view is the one put forward by Dr. Lowery. The metallurgist has had to dabble as an amateur with physical problems far too long in our industry and whilst he has succeeded in paying dividends by his endeavours, he has not succeeded in certain directions in establishing a technique of maximum serviceability. Such a case is that of sand testing, where the results obtained are of infinite use in the control of quality of output, yet the figures he produces are not universally comparable. The interpretation of X-rays is for the individual rather than for general appreciation, except in obvious cases. As for the newer technique of diffraction analysis, the average metallurgist is prepared to admit that this is beyond his scope. The demand for physicists in industry generally will be heavy in the years to come, for after a new idea has been created in the laboratory development by physicists in numerous ways remains before a variety of processes are evolved suitable for large-scale production. As, according to Dr. Lowery, only about one good physicist per million of the population was turned out by the universities per year in the immediate pre-war period, it behoves the foundry industry to assure for themselves the benefit of their quota of these rare species before they are all commandeered by competing interests. Many of the larger iron and steel companies have already introduced the latest methods of physical analysis and testing for the control of materials and products, especially during recent years, and the foundry industry has, we are convinced, much to gain from a similar policy.

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BRAINS TRUST QUERIES—III

(*Continued from page* 400, *Vol.* 67.)

A further instalment of the report of the meeting of the Foundry and Metallurgical Brains Trust of the London Branch of the Institute. Previous instalments appeared in our issues of July 30 *and August* 27.

Scabbing in Non-Ferrous Castings

Question 7.—Please give the causes of scabbing and the best methods of prevention (non-ferrous foundry). (From Mr. A. Lester.)

MR. LONGDEN said he believed the causes of scabbing were the same in the casting of any kinds of metal. In order to avoid it, one should use a suitable composition of sand and manipulate it, so that the amount of gases formed was within control; the lower the gas-forming elements, such as water and combustibles, the lower was the generation of gas. The sand should be permeable and porous, so that the gases when formed could pass away. There were, however, additional factors. Hard ramming tended to close up the sand unduly, perhaps only locally. On the other hand, local soft ramming on the mould face sometimes caused scabbing, because the gases generated tended to find an easy exit to the mould cavity through the more open grain structure of the sand. Thus, one would suggest that uniform ramming was desirable, coupled with the reduction and elimination as far as possible of the gas-forming elements in the sand.

MR. MURPHY, who expressed agreement with Mr. Longden, said he did not see why there should be any distinction between scabbing in non-ferrous and in ferrous castings, unless there was some difference of opinion regarding the definition of "scabbing." He assumed that local lack of cohesion in the sand was one of the most common causes of scabbing, and moisture locally would also have an effect.

MR. LONGDEN said that local overheating of a body of sand tended to cause a condition which might be described as "scabbing." The sand locally expanded and buckled away from the surrounding sand. One could visualise a fillet or step in the mould face and the metal rising from below, expanding the face of the sand as it rose. That was a more common cause of scabbing than had been realised in the past and deserved more attention. In order to avoid it one pinned those vulnerable sections of the sand down to the general body of the backing sand with sprigs.

MR. MCRAE SMITH, who was also in agreement with the previous speakers on the subject, said that the prevention of scabbing in castings of any metal was really a matter of foundry technique; if one used the ideal sand, rammed in the ideal manner, there should not be any scabbing. That statement, however, could be qualified according to whether one was dealing with ferrous or non-ferrous castings. In green sand work, scabbing would be due to the causes already mentioned; but in dry sand and heavy loam work it might be due to the nature of the sand. Some Scottish founders had experienced difficulties with certain types of sand, particularly when using Scotch Rotten Rock to open the structure; expansion of individual grains occurred and gave rise to scabbing.

MR. KAIN said there were many sorts of scabs, but they could be divided into two main categories, *i.e.*, mechanical scabs and thermal scabs. Mechanical scabs arose largely from the weakness of the sand under the impingement of the metal, and thermal scabs were due always to the inherent weakness of the sand and its consequent inability to meet the thermal conditions under which it was employed. The bond might be too low or the ramming conditions might be unsuitable to allow of the necessary expansion when the metal came into contact with the sand. The remedies were different for each type of scabbing.

THE QUESTION-MASTER (Mr. R. B. Templeton) commented that presumably Mr. Lester had experienced the problem of scabbing mostly in the non-ferrous foundry, but the discussion seemed to have indicated that the same difficulties were experienced in both ferrous and non-ferrous foundries. According to the Brains Trust, the trouble might be due to hard ramming and lack of permeability due to excess moisture and faulty grain size. The remedy seemed to be better venting and better practice all round.

(*To be continued.*)

MANCHESTER ASSOCIATION OF ENGINEERS

The opening meeting of the session is to be held on September 26 at the Engineers' Club, Manchester. After the presentation of the Constantine Award to Dr. D. A. Spencer and the Butterworth Award to Mr. A. W. Maycock, the President, Mr. H. L. Butterworth, B.Sc., M.I.Mech.E., will deliver his inaugural address. A full programme of lectures has been arranged, with monthly lectures on Saturdays in October, November and March, and fortnightly lectures on Friday evenings in April, May and June.

Solubility of Graphite in Gamma Iron.—The solubility of graphite in austenite, determined by carburising samples to saturation at constant temperature, is 1.39 per cent. carbon at 957 deg. C. (1,755 deg. F.) and 1.89 per cent. carbon at 1,110 deg. C. (2,030 deg. F.), states R. W. GURRY in Tech. Pub. No. 1440: "The Solubility of Carbon as Graphite in Gamma Iron," in "Metals Technology." Microscopic examination after quenching showed the carburised samples to be free from graphite or cementite at temperature. The maximum solubility of graphite in austenite, determined by a short linear extrapolation to 1,135 deg. C. (2,075 deg. F.), the temperature of the iron-graphite eutectic, is 1.98 per cent. carbon. A cementite-solubility curve, based on data reported in the literature, and consistent with the measured solubility of graphite, selected. The intersection of this curve with that for the solubility of graphite indicates that cementite is unstable relative to graphite and austenite saturated with graphite below about 1,280 deg. C. (2,336 deg. F.).

THE FOUNDRY INDUSTRY AND AIR WARFARE — III

A LIGHT-ALLOY FOUNDRY OF ROLLS-ROYCE LTD.

Control and Inspection practice at a light-alloy foundry making Merlin XX Aircraft Engines

(*Continued from page* 8.)

FOUNDRY CONTROL LABORATORY

No doubt can possibly exist after touring through the Foundry Control Laboratory that Rolls-Royce, Limited, believe in the closest possible control of foundry materials and technique by the laboratory. When one realises that although officially none of the castings on the Merlin XX engine is classified by the A.I.D. as a Class I inspection piece, yet Rolls-Royce, Limited, treat every casting in its early production stages, or after design or other modifications have taken place, as a Class I casting, one appreciates why it is that the proud record of the company is maintained at such a high level. With newly designed components, the first castings produced from a pattern are passed to the foundry control laboratory for X-ray and photomicrographical examination, mechanical testing, etc., and only after a laboratory sanction has been received is a new part released for production. Once this release has been given, no changes in technique are permitted without laboratory agreement and further thorough investigation.

X-ray Examination

The laboratory is equipped with two X-ray units, each housed on either side of a dark room for the developing of films, and linked by means of lead hatchways to facilitate rapid transfer of films for processing. The larger of the two units—a 200 k.v. set—is used for all classes of materials, including aluminium alloys, aluminium bronze, phosphor bronze, silicon bronze, and certain thicknesses of steel and cast iron. Facilities also exist with the larger unit for quick examination of castings by screening, where such

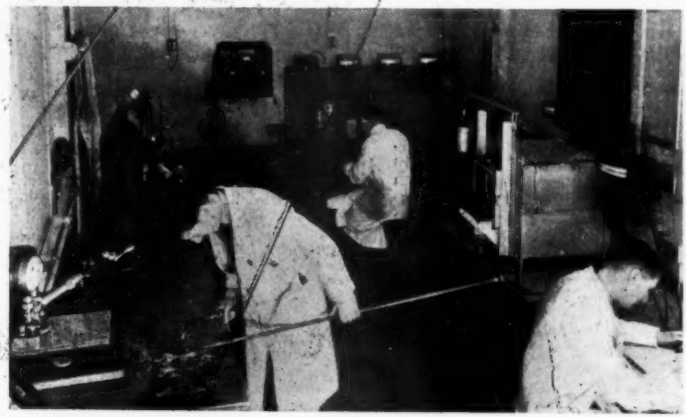

FIG. 14.—CALIBRATION LABORATORY.

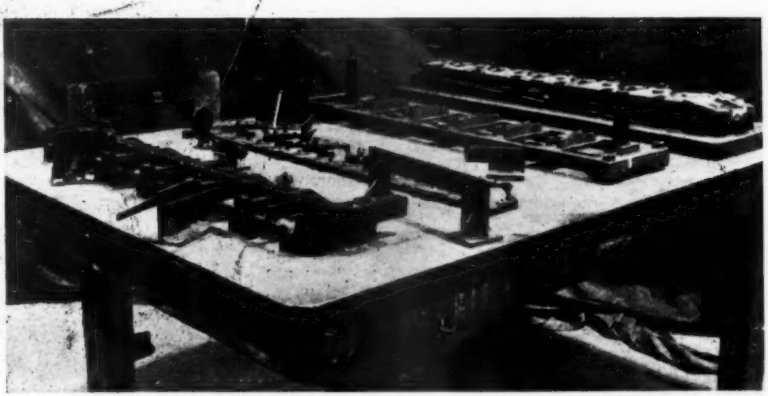

FIG. 15.—CORE INSPECTION FOR MERLIN XX CYLINDER BLOCK CORES.

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a check is considered practical. As an aid to the production of consistently sound engine castings, Rolls-Royce consider that radiological examination has come to stay. They regard this method of examination of castings, with the consequent elimination of trouble at a later stage in the machine shops, as a sound economic proposition.

Spectrographic Analysis

The advantage of collaborative work between firms engaged on similar important work who thereby meet the same daily problems was fully evinced during the review of the foundry control laboratory, particularly the spectrographic laboratory, where it was very pleasing to learn that in the district in which this factory is situated, a systematic pooling of ideas has been instituted by firms equipped with this apparatus. In addition, one learned that the manufacturers of a famous range of alloys also rendered valuable assistance in the early stages of building up the necessary staff and standards for operating the apparatus.

Spectrographic analysis is very firmly established in this particular laboratory, the unit installed being a Hilger medium quartz spectrograph (Fd. 60 cm.), the normal day's production output in the foundry yielding over 200 RR50 samples which are analysed for magnesium, on the apparatus, in addition to a full analysis of a percentage of the samples. Obviously the saving in time and labour on the determination of the magnesium content alone in 200 samples per shift by one girl more than justifies the equipment economically. Further developments are under way on the use of the spectrograph in connection with the foundry problem, and the conservation of light alloys which will more than justify the vision and foresight of the company in adopting this method of analysis.

The introduction of female laboratory assistants has been developed to the full, particularly in the chemical laboratory and mechanical testing, and when one realises that in the latter section 2,500 test-bars are pulled for tensile and elongation each normal week, some idea of the magnitude of the foundry can be gathered. Full facilities exist in the foundry control laboratory for the solution of the various problems confronting the department, and without going into close details it should suffice to say that only by visiting a laboratory of this description does one realise the tremendous strides made in the scientific control of foundry processes during recent years.

Sand Testing

Sand properties are no longer a question of personal opinion, and rule of thumb methods which formed the basis of many a heated argument amongst moulders. The modern apparatus for testing the properties of moulding and coremaking sands enables the

FIG. 16.—CORE ASSEMBLY INSPECTION FOR MERLIN XX INTAKE ELBOW.

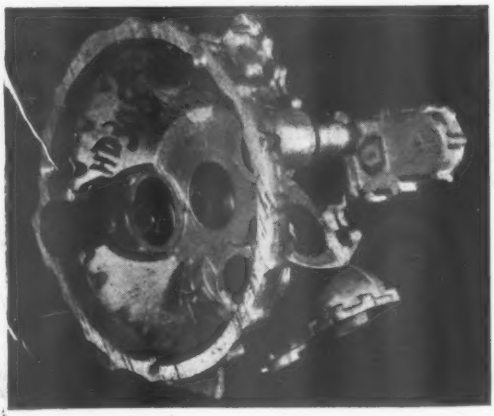

FIG 17.—MERLIN XX WHEELCASE CASTINGS SHOWING MACHINED LOCATION SPOTS.

laboratory to guarantee from day to day that the sand is consistent in all its important properties. Factors such as grain size, moisture content, green strength, permeability, are now no longer open to argument—they are in this modern foundry laid down rigidly, and maintained to extremely fine limits of consistency. An August-Simpson miniature sand mixer which is an exact replica of the 5-ton per hr. mixers in the mechanised foundry plant serves to give the laboratory samples of mixed sand on which to carry out tests, the test-pieces being produced under exactly standard ramming conditions, and baked in laboratory size drying ovens, which are thermostatically controlled to any desired temperature. Provision is made for the calibration of all the pyrometers used in the foundry, each instrument being subject to a systematic check and overhaul at weekly intervals. In the same department shown in Fig. 14 all the chromel-alumel thermocouples used in connection with the checking of metal temperatures are manufactured. These couples and the pyrometers are carefully checked before issue to the foundry against indicators and platinum-rhodium couples standardised by the National Physical Laboratory. Microscopic examination of samples is fully provided for. The facilities comprise a Vickers (Mark I) projection microscope, bench type Watson and Greenough binocular microscope, along with the necessary apparatus for mounting specimens.

FIG. 18.—CORE ASSEMBLY INSPECTION OF MERLIN XX WHEELCASE CORES.

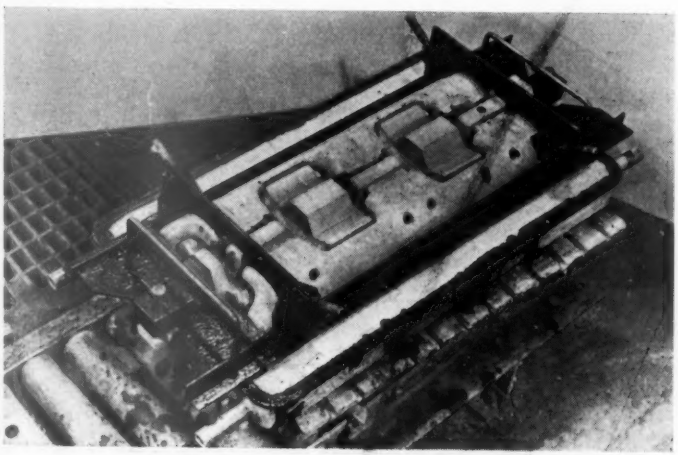

FIG. 19.—GAUGE USED FOR CHECKING POSITIONAL ACCURACY OF BODY CORES ON INDUCTION MANIFOLD.

Foundry Inspection Operations

In the various phases of the production of light alloy castings for the Merlin XX engine, although inspection operations play a major part, this subject called for specialised attention, as the Rolls-Royce standard of accuracy for castings has justifiably earned universal commendation. Extreme precision is called for in each casting leaving the foundry, normally the permissible casting wall thickness tolerance being plus or minus twenty-five thousandths of an inch. Excess thickness is obviously considered a factor of equal importance with wall thicknesses that are under the required strength, since a very careful weight analysis is maintained of the finished part, and

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under no circumstances is excess weight permitted. Consequently, the extent to which dimensional inspection is carried in the various stages of production of the casting show clearly that every possible effort is made to avoid the ultimate loss of time machining a casting which is not strictly accurate.

New pattern equipment is dealt with similarly to new dies for die-casting. It is first of all passed into a "proofing department," where the first sample castings are produced for X-ray examination by the laboratory, and dimensional inspection by the proof-inspection department. At the same time, all the important factors, such as gating and venting systems, design of production gauges for cores and moulds, pouring temperatures, etc., are determined and recorded for issue to the production foundry. On this first sample casting the proof-inspection department carry out a most rigorous and searching inspection for dimensional errors by the normal surface table method, sectioning the casting in the process to ensure that there are no hidden wall and boss sections which are not of the required strength.

The proofed and sectioned casting is then passed to the patternshop, which proceeds to adjust the pattern in line with the findings of the proof inspection, it frequently being necessary to take off up to three proofs before a pattern can be finally released to the production foundry as dimensionally correct. Simultaneously with this dimensional proof inspection, the X-ray laboratory collaborates with the proofing foundry on the establishment of a technique which yields radiologically sound castings, with the result that the patternshop receives the necessary instructions regarding gating, venting and gauging systems in parallel with the dimensional proof reports, and is thus able to release the pattern to the production foundry ready

FIG. 20.—INSPECTION AND WATER TEST OF MERLIN XX CYLINDER BLOCK CASTINGS

FIG. 21.—CONVEYOR TRANSPORTING CASTINGS THROUGH INSPECTION TO HEAT-TREATMENT.

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for quantity production without further experiment or delay.

Core and mould gauges and fixtures play an important part in maintaining the dimensional accuracy of castings on large scale production. This is quite easily understood when one realises that upwards of 40 cores are sometimes assembled in each mould, and any one core slightly misplaced is sufficient to scrap the casting. To obviate this, suitable gauges and fixtures are designed for checking the positioning of the cores with a view to eliminating all faults in the early stages of production. An example of a checking gauge and fixture is illustrated in Fig. 16. This consists of a dummy mould for the intake elbow, which is an exact replica of the production mould and is formed by reproducing a mould in stone compound around the actual production pattern, using a standard moulding box for the purpose. Each core is assembled in this permanent mould and checked for metal thickness. The whole assembly is finally checked by a composite gauge located from the pin centres.

Other typical examples of core gauges and fixtures shown in Fig. 15 are for checking the accuracy of the rocker chamber and jacket cores on the cylinder block. The latter core shown in front of the surface table is of a fragile nature and calls for 100 per cent. inspection at this stage. Fig. 18 illustrates a partly built-up set of cores for the wheelcase in a master plate-checking fixture. Owing to the many varied and intricate contours of this casting, the inspection set-up has been designed to check both inside and outside cores. These are accurately positioned by steel insert bushes embodied in the core when made (bushes shown in core on right, Fig. 18), and are located by dowels in the master fixture. The jig itself is a counterpart of the actual mould. This assembly built up enables the inspector to check each individual metal thickness before releasing cores to the production line.

The positional accuracy of the cores in the mould is checked very carefully prior to casting in all cases by specially designed jigs and gauges, a typical example of which is given in Fig. 18, which shows the gauge used for checking the positional accuracy of the various inlet and exhaust port cores in the cylinder-block casting, whilst Fig. 19 shows a gauge used for checking the position of the body cores on the induction manifold casting.

FIG. 22.—JIG AND SPOT LOCATION FIXTURES ON VARIOUS MERLIN XX CASTINGS.

Pressure Testing

Pressure testing by means of immersing the casting in hot water and applying air pressure inside the area to be tested is frequently used, and affords a rapid check against porous areas. A typical example is shown in Fig. 20, where a line of cylinder blocks is shown passing through pressure test and final thickness inspection and at the far end of the conveyor discharging into the heat-treatment section. Fig. 21 shows a power-driven pallet conveyor transporting castings through the pressure test and final inspection, and again discharging directly into the heat-treatment section. Female inspectors play their part in the organisation, particularly on the inspection of die-castings. Experience has shown that the reject hazards due to porosity and cracking are highest in die-castings, and for this reason all die-castings are passed through a most searching inspection by chalk testing immediately after the runners and risers have been sawn off, but before any other fettling operations are carried out. The casting to be tested is first of all soaked in a tank of hot penetrating oil, and afterwards covered with French chalk, the oil having first penetrated into any crack or flaw in the casting, then oozes back into the chalk, leaving a very clear indication of the presence of a fault. Female inspectors are also employed on the dimensional inspection of die-castings; naturally, of course, the hazards for dimensional scrap are considerably less on castings

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produced in permanent moulds than in those produced by sand-casting methods.

Jig and Spot Location Inspection

After the major castings have passed through the heat-treatment furnace and are thus in a stabilised condition, they then receive the final dimensional check for co-relation of general dimensions and location points are machined in them, which are to form the datum from which the machine shops proceed with the machining operations. After reference to Fig. 17, as a typical example, readers will agree that with complex castings of this description, "marking out" for machining would take a skilled man some considerable time, and since surface table methods of marking out on large castings invariably limit the dimensional check to one plane only, there is a grave risk of failure on the part of the marker-out correctly to co-relate the dimensions of the casting accurately in both planes simultaneously. To overcome this difficulty, special checking fixtures have been designed for checking the important casting dimensions, profiles, etc., in both planes simultaneously, and having "floated" the casting into such a position that all the essential features have been proved correct, a series, usually three, of location faces and dowel holes is machined in the casting from which the machine shops commence their operations.

The accuracy of the machining of the location faces is checked by means of a standard clock gauge to limits of plus or minus 0.002 in. By this means, therefore, the foundry has eliminated entirely the possibility of dimensional rejections in the machine shops due to casting errors, and at the same time saved hundreds of hours of highly skilled men's time in the process.

The average time taken to set up the casting in Fig. 17 in the jig and spot location fixture in the foundry, inspect and machine the necessary location faces and dowel holes is 18 min., which represents a very considerable saving over the very best surface table time possible. Part of the section engaged on this jig and spot location inspection is shown in Fig. 22, where fixtures on the upper and lower half crankcase, wheelcase and cylinder blocks can be seen in operation. The machined and inspected castings are then shown entering the despatch stores on roller conveyors.

(To be continued.)

(Concluded from next column.)

When these cores are being made, the coreboxes should be placed on the flat plate that will be used to carry the core in the core-oven, rammed up, the top strickled and the frame withdrawn. The cores are then ready for the stove; the half-cores should be gummed together after drying.

SKELETON COREBOXES

By "Checker."

Coreboxes can be made quicker, with a considerable saving in timber by making them in the shape of the skeleton frame of two sides and ends; this is, of course, only applicable when the shape of the core lends itself to this type of work, and when only a small number of cores are required.

Fig. 1 shows half a corebox for a round core, the two ends being half-circles, and are held apart the correct distance by two sides which are screwed to the ends. Fig. 2 shows half a corebox for a round tapered core, made with the two ends correct size inside, the big end tapered larger and the small end

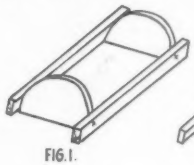


FIG.1.

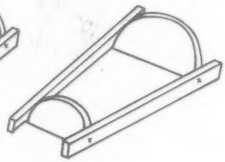


FIG.2.

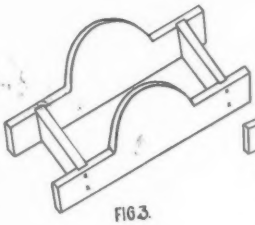


FIG.3.

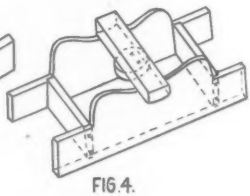


FIG.4.

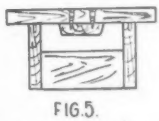


FIG.5.

tapered smaller, so that the sides could be screwed to them without difficulty, and also to allow the strickle to move over and present the correct shape, the sides in both coreboxes are made to form the shape of the core.

In Fig. 3 the two pieces of wood for the sides of the corebox were nailed together and then cut to the correct size to ensure them being identical; the ends were also cut together for the same reason, allowance being made for the rebate of ¼ in. into the sides. This makes a stronger job than the butt joint, and is preferred on the larger coreboxes. The corebox in Fig. 4 was made in a similar manner to Fig. 3, but in this instance a boss had to be carried on the top. This was done by dowelling a batten to the sides and fitting and fastening the boss to this, as shown in Fig. 5.

(Continued in previous column.)

THE SUBSTITUTING OF HIGH-DUTY GREY IRON FOR STEEL CASTINGS

By J. BLAKISTON

Report of the discussion of the Paper on "The Substituting of High-Duty Grey Iron for Steel Castings," by J. Blakiston, read at the June annual meeting of the Institute of British Foundrymen (*see* THE FOUNDRY TRADE JOURNAL *for July* 9 *and* 16).

Cast-Iron Tool Shanks

DR. A. B. EVEREST opened the discussion by congratulating the author on a very practical Paper, and said he was specially interested to notice the warning given by the author that tungsten carbide tips were not satisfactory with electric-resistance tipping machines. He personally had come across more than one case in which cast-iron shanks were being discredited owing to failure resulting from wrong manipulation in tipping. On the other hand, where muffle tipping was used, the cast-iron shanks were giving excellent results.

He was also particularly interested in Fig. 23, showing the effect of inoculation. It appeared from this diagram that 60 per cent. of the silicon content in the final castings should be added as an inoculant to get the best results. That was a higher figure than had been thought of hitherto, but it was very important from the point of view of heavy section work. A point to be remembered here, however, is that there is a definite limitation on the amount of material which can be added to the ladle without chilling the iron too much, but the line of development indicated in the Paper gave an interesting and valuable pointer.

Dr. Everest stated that he was not very happy about Fig. 28, which showed a definite discrepancy with work published in the U.S.A. This may be due to a question of definition, since it appeared in some of the later literature that a wider type of structure was defined as acicular than had been the case in this country. There was also the obvious discrepancy in the shape of the curves, but this may be due to other factors not yet fully understood.

In conclusion, Dr. Everest stated that he felt apologetic on speaking of this Paper, since it was practical rather than theoretical. There were several practical founders present, some of whom were producing castings up to 45 tons tensile strength, and he thought that their views would be of more value to the meeting.

MR. BLAKISTON, in reply, thanked Dr. Everest for his remarks concerning the Paper, and, referring to the apparent discrepancy between Figs. 27 and 28, said that probably the former was based on tests taken on a round test-piece. In Fig. 28 the test-pieces were taken from casting sections, representing a case where it was practically impossible to produce an intricate casting of absolute constant section. This fact would automatically narrow the range wherein the acicular structure could be regularly obtained, so that portions cut from the different parts of the casting would not show structural variation.

Case of Grade I Irons

MR. P. A. RUSSELL, B.Sc., remarking that he fully agreed with everything the author had said with regard to the applications and future development of high-duty grey iron, said a great deal of stress had been laid on the composition of the iron when meeting Grades 1 and 2. Personally, however, he did not consider it necessary to use 50 per cent. of steel scrap and an inoculant to meet Grade 1, and it was hardly necessary to do so to meet Grade 2. It should be realised that Grade 1 could easily be made from irons found in this country without the specially low phosphorus of 0.3 per cent. to which the author referred, and Grade 2 could be made with iron containing up to 1 per cent. phosphorus. That was an important point at the moment. It was perhaps unfortunate that Grade 1 had been included in the specification. There had been a great deal of argument about it, and it was included largely because it was not possible to find a name for anything better than Grade A321. It might have been better to have included it with the ordinary grey-iron castings, because he did not think it was sufficiently realised what an enormous proportion of present-day castings did meet Grade 1, B.S.S. 786. Grades A and C, in the engineering world, were almost obsolete. He considered the point he was making was of national importance at the present time, but as regards the development of these high-duty cast irons, he was in entire agreement with the author, and he particularly liked the author's shock test.

The AUTHOR said he was in entire agreement with what Mr. Russell said with regard to the inoculant for Grades 1 and 2, and it was possible to produce irons to meet these grades in a much cheaper manner than he had enumerated, but this Paper was written with the sole purpose of giving a starting off point for those interested in the higher grades of grey iron. As regards the 0.3 phosphorus content, this was kept low for shock resisting castings, and Mr. Russell would agree that where the demands required considerable shock resistance it was necessary to keep the phos-

High-Duty Grey Iron as Substitute

phorus low, and where high-duty grey iron was used to replace steel castings the shock resisting factor was always prominent.

MR. RUSSELL said he agreed that the phosphorus should be kept low for shock resisting properties, but what he rather objected to was the general statement that in order to meet Grades 1 and 2 the phosphorus must be kept below 0.03.

The AUTHOR remarked that he thought Mr. Russell and himself were in agreement.

MR. R. H. BROWN, commenting that the Paper was almost self-explanatory, asked for some details of the control board, and inquired what distance it was away from the furnace, as he rather anticipated variations in the readings if the distance was considerable.

The AUTHOR replied that the control board was a considerable distance from the cupola, a matter of 30 ft. The bore of the tube of the differential gauge was $\frac{1}{8}$ in. dia., but there was no flow through that tube at all. The tubes of the Budenberg gauges were the same diameter, and again there was no flow through them. The air was more or less static. There was a lag of a few seconds on the gauge, but as the air was more or less static in all the tubes he did not think the diameter mattered at all. The metallurgist every week inspected the nozzle of the Pitot tube to see that no obstruction was lodged in it.

Disposition of Charges

MR. STANIER said that as the owner of a modest foundry he very much appreciated this Paper. He had never realised that such things could be done in a small shop, and he thanked the author.

MR. G. L. HARBACH, referring to the statement in the Paper that in cupola operation the steel should be on top of the pig-iron and scrap, and any alloy addition should be in the centre, said he was a little doubtful as to whether this really mattered. Considering that the steel would probably melt, not by carburisation from the coke, as was generally understood years ago, but rather from the liquid iron dripping on to the steel and carburising it in that way, would not it be more logical to expect the steel to be at the bottom of each charge instead of at the top, if each charge was to be kept separate?

Later on in the Paper it was stated "The carbon is maintained constant and free from well pick-up by tapping regularly at short intervals." He was quite aware that it was the popular idea to get it out of the well as soon as possible, but his own experience indicated that it did not matter how long it remained in the well, as there was very little, if any, carbon pick-up. The carbon pick-up took place whilst the metal passed the tuyeres, and he did not think it was increased very much afterwards. Finally, he asked what was the tapping temperature in the case of a 15-cwt. furnace.

The AUTHOR replied that the position of the steel in relation to other portions of the charge had an influence on the final carbon figures. Any alteration in the position of the materials of the charge definitely affected the final analysis of the metal. This however depended on the individual cupola peculiarities. On small cupolas the effect was more marked, and it was also found that the small furnace melted at a much lower carbon content in the final iron than did the big furnace. The regular tapping, apart from the carbon pick-up consideration, the theory of which may be right or wrong, was also advisable on account of maintaining regularity in the melting operations. The tap temperature was round about 1,450 deg. C., and in a jobbing foundry there are always a few moulds for certain components which require cooler irons and for which a high carbon content associated with preliminary taps was immaterial.

The CHAIRMAN, proposing a vote of thanks to the author—which was cordially given—expressed the hope that some of those with small foundries and desiring to come into the high-duty iron picture, would feel they had an incentive to start right away and endeavour to produce the type of article that was going to be sold in the future.

FLAME DE-SCALING OF CASTINGS

It is evident from an article written by Mr. E. W. Deck in "Steel" that the de-scaling of castings by means of an oxy-acetylene flame has reached considerable magnitude in the United States. The article goes so far as to state that in the majority of cases it is easier, faster and cheaper than "sandblasting." The average hourly production per man is claimed to be of the order of 25 to 30 tons. Other claims are that flame de-scaling shows up surface defects very readily and that the heat of the flame has no deleterious effect even on the lightest section. A typical tool used will carry about two dozen small jets arranged in line along a foot length, but naturally variations are made for different jobs. A final interesting feature is that burnt-in sand is stated to be "popped loose" with the underlying scale.

Iron and steel scrap consumption in the United States in the first half of 1942 was greater than in all 1917, and nearly three times that in 1932, states the Institute of Scrap Iron and Steel, Inc. Total consumption for the first half year was 27,843,000 gross tons, of which 15,300,000 tons were works scrap and 12,500,000 tons supplied by dealers.

CASTING ALLOY ROLLS*

By PAUL R. RAMP

Use of makeshift tackle in an effort to economise on direct costs is often the cause of unnecessary losses when casting alloy rolls. These losses can generally be overcome with a little forethought in planning the moulding procedure.

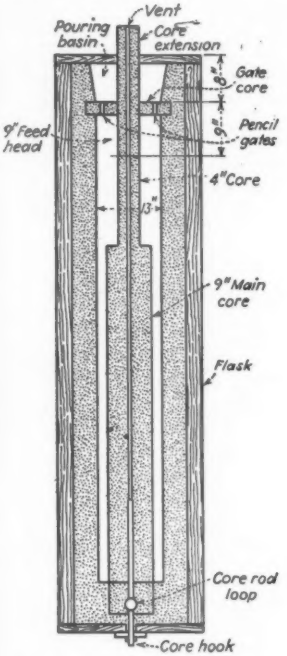


FIG. 1.—CROSS-SECTION VIEW OF A 132-IN. ALLOY ROLL MOULD SHOWING POSITION OF GATE CORE AND CORE HOOK.

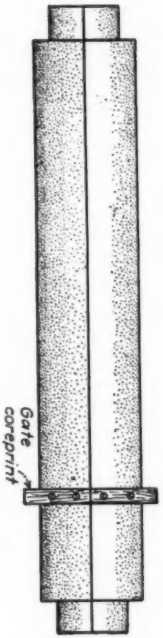


FIG. 2.—A STANDARD TYPE OF SPLIT ROLL PATTERN, WITH GATE COREPRINT IN POSITION.

A successful, and economical from the point of view of average roll cost, method of moulding such rolls is illustrated in Fig. 1. This sketch is a cross-sectional view of a 132-in. roll which is made with a standard 13-in. split core pattern shown in Fig. 2. The box consists of a simple cope and drag arrangement, as illustrated in Fig. 3.

After ramming up, the mould is dried, placed on a level floor or bed and the gate core placed in the print in the drag section. This gate core, shown in Fig. 1, is provided with a number of pencil or pop gates and forms the bottom of the pouring basin.

The centre portion of this gate core forms the core print for the upper end of the main core and must be strong enough to support the main core. After the gate core is in place the main core is positioned. By using a split mould, such as is shown in Fig. 3, it is possible to locate and secure the core without danger of dirt or shifts. The main core is provided with an eye bolt which makes it possible to hold the core down (see Fig. 1).

Using a core hook prevents the core from moving

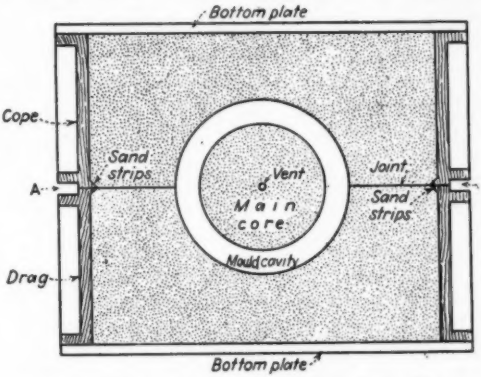


FIG. 3.—CROSS-SECTION VIEW OF A ROLL MOULD SHOWN IN FIG. 1. NOTE THE SAND STRIP AND FLANGE AT A FOR CHALKING.

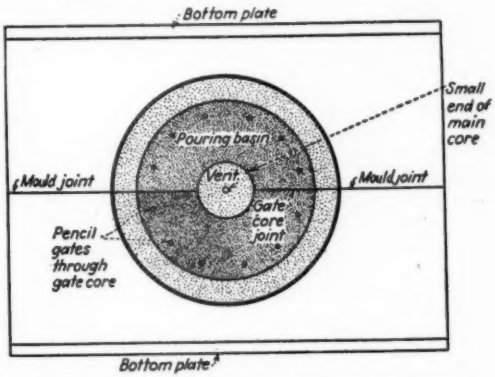


FIG. 4.—TOP VIEW OF THE MOULD IN POURING POSITION, INDICATING THE LOCATION OF THE PENCIL GATE.

* Reprinted by courtesy of the Editor of "The Iron Age".

Casting Alloy Rolls

when a clamp or weight is placed on top of the core. When using makeshift flasks where the core must be held down from the top end, the casting is sometimes lost by becoming deformed unless the weight or clamp is removed as soon as the danger of the core floating upward has passed.

The cope half of the gate core is next placed in the cope and the mould closed, clamped and upended for pouring.

The location of the gate core in the moulding procedure described here provides additional length for the feed head. The head in Fig. 1 is about 7 in. long, while the pouring basin is approximately 8 in. deep. The vent from the main core is carried out through the top end of the core.

Fig. 4 is a view looking down on the pouring basin showing the spotting of the pencil gates. There are 12 of these gates, running not over ½ in. in diameter. It is important that these gates be so located that the metal will drop freely to the bottom of the mould and will at no time strike the core or wall of the mould. The mould itself must be in an exactly vertical position, or it is likely that the metal will not drop freely into the mould.

The core print on the split pattern (Fig. 2) can be adjusted to give the proper relation between the roll length and the depth of the feed head.

The proper flask setup for this type of work (Fig. 3) consists of two drags, with no bars except one or two tie-bars, depending upon the length of the flask. The sand strips are adequate to carry the sand when the cope is raised. These strips are aided in a large measure by the half-pattern that makes up the cope and which is secured by means of a wood screw through the bottom plate. This arrangement eliminates the danger of the core dropping out after the mould drying operation.

An advantage of a barless cope is that it reduces the possibility of soft spots which often occur under the bars. A flask of this type is also easier to ram up and shake out. A space is provided on the flask (A, Fig. 3) for chalking with sand after clamping.

JAPANESE PIG-IRON PLANS

For some time past, the Japanese have been preparing to mine iron ore on the island of Hainan. It is now reported that the first shipments have left for Japan. The work has been undertaken chiefly by the Ishiwari concern, which will use the ores mixed with its own low-grade ores mined in Japan Proper. Proposals have also been made for building an ironworks in North China, near Tientsin, to smelt some of the local ore, which is now shipped to Japan. The capacity of the plant will be 700 tons of pig-iron a day, using Shantung coal for coke making. The pig-iron will be sent to Manchuria to be made into steel, but later, when a sufficient supply of manganese is available from the newly-prospected Jehol deposits, a steelworks will also be built.

U.S. CHROMITE NEEDS

In 1940, the United States consumed more than 600,000 tons of chromite, all of which was imported except 2,662 tons mined in the country. It came from Africa, the Philippines, India, New Caledonia, Turkey, Cuba and Greece. Imports for the first nine months of 1941 reached approximately 650,000 tons, and domestic production rose to about 13,000 tons. With increasing wartime demands, it may be expected that chromite consumption will advance to a new high record in 1942 and 1943. About 85 per cent. of the chromite is used by the metallurgical and refractory industries. The United States must consider the utilisation of all possible domestic sources of chromite, states Dr. Sayers, of the Bureau of Mines, because the Philippines, which in 1940 furnished 156,000 tons of chromite, have been isolated, and the 160,000 tons received annually from India, New Caledonia, Greece and Turkey is now uncertain due to the war and shipping conditions.

A new metallurgical process for treatment of the large American deposits of low-grade chromite ores to help satisfy the urgent wartime demand for chromium has now been developed by the Bureau of Mines, and has successfully passed all tests made thus far and has proved to merit large commercial production. The Bureau's new method, which is a roasting and leaching process, is designed to convert chromite concentrates into a higher grade of material which may be used to produce either high-purity chromium or standard ferro-chromium for the manufacture of alloy steel. It is capable not only of increasing the chrome content of the ore, but can also raise the ratio of chromium to iron from about 1.7 to 1 up to as much as 30 or 40 to 1.

Vast deposits of low-grade chromite reserve ores in Montana, estimated at 2,500,000 tons, and deposits of similar ore in other western States are expected to furnish the raw materials for concentration plants and proposed processing plants. The Montana deposits located in the Benbow and Mouat areas of Stillwater County, Montana, are believed to contain enough chromium to yield over 900,000 tons of chromite (concentrates containing 45 per cent. or more chromic oxide) of a grade suitable for making ferro-chromium.

Practical Economies in the Use of Corebinders.—Owing to pressure on our space, the second instalment of this Paper, presented to the London Branch of the Institute by Mr. A. Tipper, has been held over to next week.

A.F.A. Form Light Alloys Division.—Recognising the increasing demand for aluminium and magnesium castings and the rapid growth of those divisions of the foundry industry, the American Foundrymen's Association has divided its present Non-Ferrous Division to create a new Light Alloys Division. The present Non-Ferrous Division, the membership of which included those interested in the production of brass, bronze and light alloy castings, will become the Brass and Bronze Division.

INSTITUTE OF VITREOUS ENAMELLERS

ANNUAL GENERAL MEETING IN BIRMINGHAM

The annual general meeting of the Institute of Vitreous Enamellers was held on Saturday afternoon last at the Grand Hotel, Birmingham. It was preceded by a luncheon and followed by a technical meeting at which Dr. J. C. Hudson, official investigator for the Corrosion Committee of the Iron and Steel Institute, presented a Paper on "The Use of Vitreous Enamel for Protecting Anti-Glare Sheeting." Much of the material being of a confidential nature, the Paper and discussion were taken in private session.

Chairman's Report

Reviewing the year's work, the CHAIRMAN, MR. W. H. WHITTLE, said that at a time when the enamelling industry was largely shut down or converted to other work, it was gratifying to be able to record that the Institute had not only remained in existence but had fulfilled functions brought about by war conditions, and was preparing for progress after the war. Although a number of members had resigned, this had been partly balanced by new members, the total membership thus comparing very favourably with that of the two previous years. By careful management of the Institute's accounts, the financial position had been further strengthened in preparation for the expansion of activities after the war. Travelling difficulties and demands on members' time had made it hardly worth while to arrange Section meetings, although the Scottish Section held its usual once-yearly joint meeting with the Institute of British Foundrymen. During the year the Southern Section had been engaged in the co-ordination of technical and industrial information relating to the raw materials of the vitreous enamelling industry, principal attention being first devoted to the felspars. This work was proceeding.

The Council had held five meetings during the year, at each of which there were discussions on subjects affecting the future of the Institute. Among the subjects discussed were the training scheme to produce young technicians for the industry; the prospects of the use of vitreous enamel as an architectural material; the programme of research, and the constitution of the Council, including proposed amendments of the method of election of Council members.

A further important part of the Institute's work had recently been that of acting in an advisory capacity to Government departments, particularly branches of the Ministry of Supply. A committee was appointed to draw up recommendations for the supply and use of materials employed as enamel opacifiers, and a report was duly presented to the department concerned. In this work close contact was maintained with sections of the enamelling industry not previously well represented in the Institute. In addition to this, inquiries from members and others for technical information had been dealt with. Progress had been made with the research programme and some special experiments had been made for official bodies.

Although "Enamelling Abstracts" continued to be published quarterly, the annual proceedings for 1941 and 1942 would be published together as a single volume. Subject to paper being available, it was hoped to publish further technical reports.

The point mentioned earlier about the constitution of the Council was that it would be recommended to the members that after the war the Chairman should retire annually and become an *ex officio* member of the Council. This would mean that a vacancy would then occur on the Council, so that an additional member would be elected. A special meeting would be necessary for this, to pass the resolution to alter the Articles of Association. Members would be notified of the meeting in due course. The Council had always welcomed constructive criticism, but a team spirit was required in organisations like the Institute of Vitreous Enamellers, and particularly at the present time when travelling to meetings was so difficult and most members were very busy on work of national importance.

Mr. Whittle referred briefly to the visit of the Council during the morning to the new quarters of the British Cast Iron Research Association at Alvechurch, and commented on the scope there afforded for the work in hand. He also spoke of the training of young technicians, which in his opinion was a very important matter. There were not too many in the industry at the commencement of the war, he said, and with the wastage and change of occupation which were unfortunately bound to take place, there would be an acute shortage afterwards. If further arrangements were made for training young technicians, he thought the Council would very seriously consider coming to some understanding with the B.C.I.R.A. for the training to take place at Alvechurch. In conclusion, Mr. Whittle took the opportunity, on behalf of the Council, of wishing all members in the Services the best of luck and a speedy return.

The Hon. Treasurer (Mr. W. S. Grainger) presented the financial statement. The report and accounts were adopted.

Election of President

MR. W. TODD said that at the Council meeting, held during the morning, a communication was read from Prof. J. H. Andrew in which he expresed the opinion that it would be in the interests of the Institute if someone was appointed in his place as President. He had held the office, the letter went on, during a most difficult period, when travelling was curtailed, and he was afraid that he had been of very little assistance. For this reason he felt it would be better to appoint someone who were able to get to the meetings and take a full share in the responsibility for the management of the Institute. Mr. Todd said the Council considered the matter, and very reluctantly agreed to fall in with Prof. Andrew's suggestion. At the same time they took the opportunity of recognising the services that Mr. Whittle had rendered to the Institute since its inception. Right from the time of the first

Institute of Vitreous Enamellers

meeting Mr. Whittle had taken it into his hands to guide the destinies of the Institute. He had not stinted his work, and had given inestimable service in moulding the structure upon which the future of the Institute so much depended. Therefore, on behalf of the Council, Mr. Todd asked the meeting to accept as President of the Institute for the ensuing year Mr. W. H. Whittle. Mr. Whittle took a practical and economic view of the industry, and under him they would go forward to a new era in the post-war years.

MR. V. C. FAULKNER supported Mr. Whittle's appointment, remarking that the new President had led the Institute to a position of some eminence among the technical societies of the country, and had well earned the honour which was being bestowed on him.

The election of Mr. Whittle was heartily endorsed by the meeting, and, speaking in acknowledgment, he said that, whatever his faults might be, his interest would always be that of the Institute. Mr. Whittle added that the Council had appointed Mr. Todd to succeed him in the chairmanship, and concluded by proposing Mr. J. W. Gardom as Vice-President.

MR. W. S. GRAINGER seconded the proposition, and spoke of the enormous amount of work which Mr. Gardom had done behind the scenes. He was the convener of the research activities of the various Panels set up, and had rendered invaluable service.

The motion was carried.

MR. GARDOM returned thanks. He was greatly interested in the work of the Institute, he said. He had done something towards pushing it forward, and he would continue to do all he could in the same direction in future.

The PRESIDENT, before vacating the chair in favour of Mr. Todd, placed on record the appreciation felt of the services of Dr. Martin.

Under Mr. Todd's chairmanship, the first business was a ballot for the election of three members of the Council. It was announced that the successful candidates were Mr. S. W. Vickery, Mr. H. H. Aston and Mr. V. C. Faulkner. Messrs. Wenham Bros. were reappointed auditors.

The CHAIRMAN gave a brief account of the visit to the new premises of the B.C.I.R.A. at Alvechurch, where he said a property known formerly as Bordesley Hall had been acquired. Here portions had been converted into various laboratories and investigation rooms. One section would be devoted to research in connection with enamelling under Dr. Martin. So far as the Institute was concerned, it was suggested that they should consider the possibility of the establishment of student courses, presumably immediately after the war. Whether the courses would be part-time or full-time, he did not know. The matter would be considered by the Council and, when the scheme was complete, would be submitted to the members for consideration and, he hoped, for suggestions. The laboratories would be fully equipped and, if the Institute took part in the scheme for their own students, they would put in such equipment as they deemed necessary for investigation and research work in connection not only with the determination of the various chemicals required in the making up of frit, but in its application to the various base metals with which they were concerned. Mr. Todd added that the surroundings of the building were ideal and conducive to intensive study. He also foreshadowed some recognition of Mr. Whittle's splendid services, which might take the form of a function in London towards the end of the year, at which Mr. Whittle would be their honoured guest.

The technical meeting followed.

GASES IN METALS

All molten metals and alloys contain a considerable volume of gases, the bulk of which are derived from furnace atmospheres. Pointing out the deleterious effect of these impurities, an anonymous author in "Usine belge" suggests that a study of the conditions in which these gases are trapped and can be eliminated must be preceded by a fundamental investigation of the laws of solubility of gases in the metals concerned, the dependence of solubility on temperature and pressure, the nature of diffusion of gases in metals, as well as the state in which these gases occur in a metal, whether present as a physical solution, or as inclusions, or as chemical compounds. Gases similar to all other impurities affect the properties of a material not merely by virtue of their concentration, but also, and sometimes principally, by the form of their occurrence and their distribution. Gases present in metals can be distinguished as follows, according to the nature of their occurrence:—(1) Gases retained at the surface of a metal by adsorption forces, a purely physical process, whose effect diminishes with rise in temperature; (2) gaseous inclusions or bubbles retained mechanically in a metal, due mainly to sudden changes in the solubility of a gas caused by temperature changes or by the introduction of certain metallic additions or by reactions in the molten metal; and (3) gases present as chemical combinations, either with the metal components or independent of them, both of which affect the mechanical properties.

According to the work of Sieverts and Iwase on Henry's law, gases dissolved in metals are in an atomic state, the solubility usually increasing with the temperature. On cooling, a sudden change in solubility occurs at the moment of solidification, which is accompanied by a copious liberation of dissolved gas. In general, the rate of diffusion depends on the state of the surface of a metal, temperature and pressure being constant. Gases are the more readily taken up by metals, the greater their chemical affinity. Gas inclusions can so radically affect the properties of a metal that the determination of the gas content of metals has become a routine operation in metallurgical laboratories, although many methods used for this purpose are not entirely satisfactory. Analytical apparatus is required which will enable the gaseous impurities of metals to be determined with the same high accuracy as other impurities.

STANTON *Dale* REFINED PIG IRON

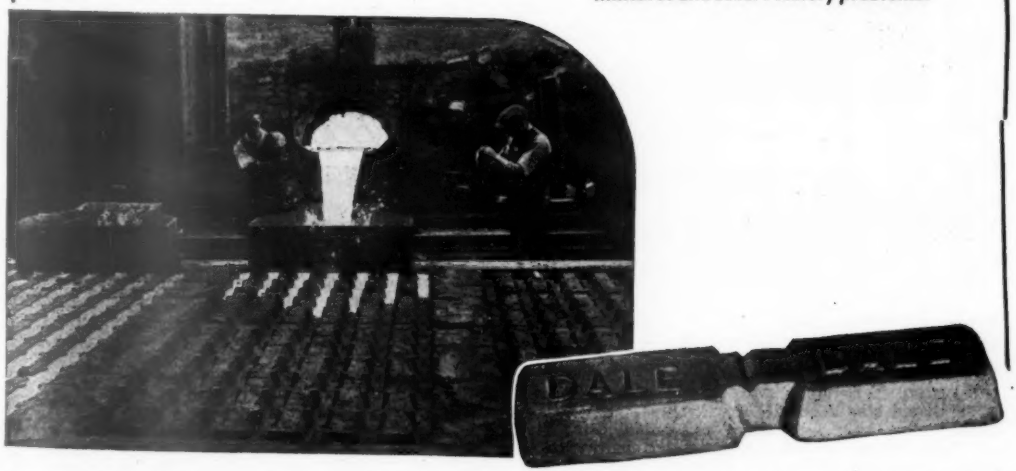
IS CHARACTERISED by closeness of grain structure, uniformity of composition and fine graphitic carbon evenly distributed.

IS PRODUCED to guaranteed analysis in seven standard grades.

CAN BE MADE to customers' individual requirements with total carbon from 2·6 per cent. upwards.

SHOULD BE USED to tone up high phosphorus irons and scrap, to replace Hematite, and to produce castings for all high duty purposes.

Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.



THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

546,169 MEEHANITE METAL CORPORATION. Furnaces.
546,179 LOWINGER, V. A., and HEDGES, E. S. Processes for the coating of metals.
546,220 TUGWOOD, R. J. (Heuer, R. P.). Refractory bricks, and the moulding thereof.
546,269 TRIGGS, W. W. (Carnegie-Illinois Steel Corporation). Method of recovering non-volatile solutes in electro-plating operations.
546,302 HIGH DUTY ALLOYS, LIMITED, and HERON, J. A. Severing of metals by fusion.
546,371 BRITISH THOMSON-HOUSTON COMPANY, LIMITED. Refractory melting pots, and methods of preparing the same.
546,378 FAIRWEATHER, H. G. C. (National Smelting Company). Aluminium base alloys.
546,387 TITANIUM ALLOY MANUFACTURING COMPANY. Refractory composition and method of making the same.
546,400 SCIENTIFIC AND INDUSTRIAL RESEARCH, HONORARY ADVISORY COUNCIL FOR. Magnesia refractory for brick and furnace linings.
546,413 WELSFORD, H. G., and MUIR, W. P. Method and apparatus for forging billets.
546,423 HIGH DUTY ALLOYS, LIMITED, MASSEY, LIMITED, B. & S., AUGER, H., and PICKWORTH, P. C. N. Lifting mechanism for the tups of drop hammers.
546,427 TRIGGS, W. W. (Carnegie-Illinois Steel Corporation). Device for holding metallic strips in contact with conductor rolls.
546,446 LOEWY ENGINEERING COMPANY, LIMITED (Cotter, sen., W. W.). Die for the extrusion of oxydisable metals and alloys.
546,480 AMERICAN ROLLING MILL COMPANY. Means for indicating the off-gauge length of strip passing through strip-rolling mills.
546,490 HARDY METALLURGICAL COMPANY. Production of finely-divided metals from metal compounds without fusion.
546,556 NORTH BRITISH ELECTRIC WELDING COMPANY, LIMITED, and GLOVER, T. S. Manufacture of studded chain links.
546,564 GOODWIN, J. T., and SHORTER, A. E. Surface hardening of bombs or like metal objects.
546,627 BJORKMAN, E. B., and ESCOR INDUSTRIES, LIMITED. Method of and apparatus for granulating blast-furnace slag.
546,628 BJORKMAN, E. B., and ESCOR INDUSTRIES, LIMITED. Manufacture of cement from blast-furnace slag.
546,629 BJORKMAN, E. B., and ESCOR INDUSTRIES, LIMITED. Method of manufacturing super-sulphated slag cement.
546,681 UDY, M. J. Processes and products for the production of low-carbon chromium alloys.
546,682 UDY, M. J. Production of chromium alloys.
546,733 LINDE AIR PRODUCTS COMPANY. Apparatus for thermally desurfacing metal bodies.

IRON AND STEEL CONTROL

SIR CHARLES WRIGHT RESIGNS

Sir John Duncanson, the present Deputy-Controller, has succeeded Sir Charles Wright as Iron and Steel Controller, Sir Charles having resigned owing to ill-health. Sir Charles Wright, who became Controller in January, 1940, occupied a similar position during the last war.

Mr. A. K. McCosh has resigned from his position as Deputy-Controller, Raw Materials, Iron and Steel Control, in order to be free to devote himself to the affairs of the coal industry in Scotland. He was appointed in September, 1939, his task being to keep the steel industry supplied with the necessary raw materials for maximum production. He will remain at the disposal of the Iron and Steel Control for consultation.

Joint Deputy Controllers Appointed

Major J. M. Campbell, O.B.E., M.C., and Mr. C. R. Wheeler have been appointed Joint Deputy Controllers, Raw Materials, to succeed Mr. McCosh.

Major J. M. Campbell, for some time Director for Foreign Ore (Iron and Steel Control), is chairman of Fergusson, Wild & Company, Limited, iron ore and mineral merchants, of Middlesbrough, a director of Sierra Leone Development Company, Limited, Sinai Mining Company, Limited, United Steam Navigation Company, Limited, and other industrial undertakings.

Mr. C. R. Wheeler is a director of Guest Keen Baldwins Iron & Steel Company, Limited, Briton Ferry Works, Limited, Cribbwr Fawr Collieries, Limited, Dowlais Collieries, Limited, and other concerns.

New Director for Foreign Ore

Mr. D. H. Kyle has been appointed Director for Foreign Ore. He is a director of Fergusson, Wild & Company, Limited, Middlesbrough.

SCIENTIFIC ADVISERS FOR PRODUCTION MINISTRY

The appointment of three full-time scientific advisers has been announced by the Minister of Production in order to ensure that the fullest use is made of our scientific and technical resources in the field of production. Those appointed are Mr. W. A. Stanier (Chief Mechanical Engineer, London Midland & Scottish Railway), Dr. T. R. Merton (treasurer of the Royal Society), and Dr. I. M. Heilbron (Professor of Organic Chemistry, Imperial College of Science and Technology). The field of their activity will be co-extensive with the responsibility of the Minister of Production. They will keep in close touch with the scientific advisers of the Service and Supply Departments, and will be available to assist the departmental organisations of scientific research and technical development. They will not supersede the departmental organisations, which will, for instance, continue to be responsible for the examination of new inventions and technical suggestions in their own fields.

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NEWS IN BRIEF

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, of Watford, have recently celebrated the 25th anniversary of the formation of the company. The company was formed in the last war, and was based largely on technical collaboration between Mr. L. W. Wild and the late Mr. E. P. Barfield in connection with the war effort.

THE STOCK EXCHANGE Committee have granted permission to deal in respect of 480,000 £1 ordinary shares of Johnson, Matthey & Company, Limited, precious metal smelters and refiners. The company also directly controls Johnson & Sons (Smelting Works), Limited, Mallory Metallurgical Products, Limited, and other companies.

A COMMITTEE representing the A.E.U., the National Union of Foundry Workers, the Associations of Engineering and Shipbuilding Draughtsmen, and the Confederation of Engineering and Shipbuilding Trades Unions has been formed to co-ordinate the activities of works' production committees, and generally to deal with production problems in the district.

THE BOARD OF TRADE have decided, with the approval of the Treasury, that the premium payable under the business scheme for the whole year to September 30, 1943, shall not exceed £1 per cent. For the period of six months up to March 31, 1943, the rate of premium will be 10s. per cent. and will be payable in one sum. The rate of premium for the subsequent six months will be determined in March next and will not exceed 10s. per cent.

AT A MEETING at Blackpool last week of the joint trades movement of the engineering and shipyard unions, it was agreed to apply for a "substantial" all-round increase of wages and at the same time to make a special claim for plain-time workers. Particulars of the claim were not disclosed. It is considered to be the most comprehensive wage claim to be made since the beginning of the war. While there is a natural relation between engineering and shipyard wages, hitherto the wage movements in the two industries have been undertaken independently.

THE MINISTRY OF LABOUR has issued a pamphlet entitled "Wartime Employment of Women in Shipbuilding and Allied Industries," in which it is pointed out that present labour demands in the shipbuilding and allied industries run into several thousands and they must increase with the expanding shipbuilding programme. Existing male labour has to be used to the best effect, women replacing men on the lighter jobs, thus releasing them for heavier work on other jobs in which their experience can be used to best advantage. In some yards a start has already been made, and examples of the many occupations in which women have successfully replaced men are quoted in the pamphlet.

AT A RECENT MEETING in Edinburgh, attended by Scottish M.P.s, Mr. Thomas Johnston, M.P., Secretary of State for Scotland, gave a survey of the position of Scottish industry. Discussing the location of industry and the movement of women labour South, Mr. Johnston mentioned that in the seven months to July 31, 1942, 90 new production units had been set up in existing premises in Scotland, in addition to 22 new factories or extensions. Unemployment had fallen from 33,250 in February to 22,000 in July, and of the number still unemployed the majority were in transit from one occupation to another. He added that during 1942 to the end of July nearly 2,000,000 sq. ft. of space had been allocated in existing accommodation to production for war purposes in Scotland and some 3,250,000 in storage.

INDUSTRY AND POST-WAR EXPORTS

In an address to members of the Engineering Industries Association in London recently, Dr. A. P. M. Fleming, a director of Metropolitan-Vickers Electrical Company, Limited, dealt with some problems which British industries will be faced with after the war. He said that the problem of exports was one which was of concern to the entire community and in the ultimate determined whether we exported goods or population. In earlier times industry was built up on the natural mineral resources of this country and by our manufacturing genius. Our export business was facilitated by our great overseas carrying capacity, and our whole economic position strengthened by our overseas investments. These assets were by no means so valuable to-day, and in some respects had vanished entirely. Dr. Fleming said that in part the old competitive system might be re-established, but it was impossible at this time to make any specific plans for the future conduct of export business.

One of the problems of the future would be how to ration the available supply to meet the most important of the national needs. While it was true that modern mass-production methods operated against the need for certain types of skilled artisans, on the other hand the production of the tools of production called for an even greater degree and quantity of skill than heretofore, Dr. Fleming said. To all concerned with manufacture for export he urged the importance of research.

CONSERVATION OF RUBBER SUPPLIES

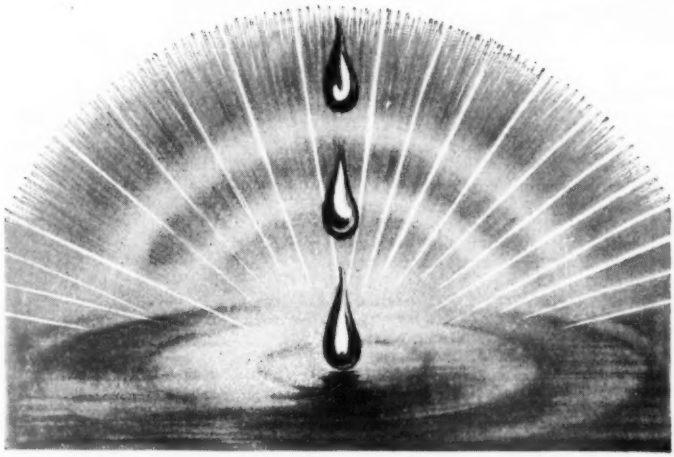
Under an Order made by the Ministry of Supply it is now an offence to destroy or throw away waste rubber. Ninety per cent. of the world's natural rubber resources is in enemy hands. It is essential to economise in the use of rubber in every possible way, and for every scrap of waste rubber to be handed in for salvage in order that it may be re-manufactured for war purposes. Drivers of motor vehicles have a special responsibility. Care in the use of tyres is the most effective way to conserve rubber resources.

MR. ALEXANDER MCCROSTIE, engineer, late of Miller & Company, Limited, ironfounders, makers of chilled rolls, etc., of Edinburgh, died last week.

SEVEN PILLARS OF PROGRESS

6. All groups of scientific workers are united in the fellowship of the commonwealth of science, which has the world for its province and the discovery of truth as its highest aim.

"The Charter of Science"—British Association, 1941.



To the pool of knowledge, scientific workers of every nation are continually adding their quota. Out of this brimming pool there radiates the inspiration for new ideas and fresh discoveries in the pursuit of truth. The technologists transmute these findings into improved materials and methods. They anticipate the needs of those industries which are exploring unknown realms, so that each step may be taken with complete confidence in the materials they use. Greater or lesser requirements are of equal merit, as the seed of an idea to-day may germinate and grow to be a plant of importance to future generations. The Fellowship of the Commonwealth of Science numbers this company among its many members. With the grouped resources which we can command, the most recent scientific and technical achievements in the metallurgical world are available to all those who may desire to share their benefits.

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The Rothervale Collieries, Treeton | United Coke & Chemicals Co. Ltd. | Thos. Butlin & Co., Wellingborough

U.S.P 6

COMPANY NEWS

(Figures for previous year in brackets.)

Clayton Dewandre—Interim dividend of 4% (same).

Dobson & Barlow—Ordinary dividend of 8d., equal to 9$\frac{11}{21}$% (same).

Craven Bros. (Manchester)—Interim dividend of 5%, less tax (4%).

North British Locomotive—Dividend of 2½% on the 5% preference shares.

Minerals Separation—Interim dividend of 10% actual, less tax (20%).

Leeds Fireclay—Dividend on the 6% non-cumulative preference shares omitted.

Glover & Main—Ordinary dividend of 4%, less tax, for the half-year to June 30 last (nil).

Bairds & Scottish Steel—No interim dividend in respect of the current year (2%, less tax).

Modern Machine Tools—Final dividend of 12½%, making 20% (same) for the year ended December 31 last.

Ransome & Marles Bearing—Final dividend of 15%, less tax, making 20% for the year ended June 30 last (same).

International Diatomite—Revenue for the year to March 31, 1942, £1,732; after fees and income tax there remains £660; forward, £1,040.

Johnson (Richard), Clapham & Morris—Final ordinary dividend of 11½%, making 15%, less tax (same); dividend of 1% on the 6% non-cumulative participating preference shares, making 7% (same).

W. H. Dorman—Net profit for the year to March 31, after expenses, depreciation, war risks insurance and pension scheme, £78,495 (£67,703); to general reserve, £7,000 (£10,000); to taxation reserve, £52,500 (£36,000); ordinary dividend of 16¼% (same); forward, £7,424 (£7,095).

Brightside Foundry & Engineering—Trading profit, after tax, for the year to June 30, £96,493 (£78,415); directors' fees, £375 (£500); net profit, £95,758 (£77,909); to war contingencies reserve, £25,000 (same); 5% preference dividend, £2,500 gross; ordinary dividend of 25%, £43,750 (same); forward, £72,445 (£47,937) (after £2,000 to staff fund).

Steel & Company—Trading profit for the year to March 31, after tax, £27,211 (£19,487); directors' remuneration, £4,611 (£4,770); fees, £400 (same); depreciation, £6,033 (£4,508); net profit, £16,167 (£9,809); to preference dividend for year, less tax, £3,300 (£6,600 gross); written off goodwill, £4,778 (nil); to reserve, £2,500 (nil); ordinary dividend of 7½%, less tax, £4,125 (6%, £6,600 gross); forward, £3,783 (£2,319).

MR. THOMAS NIGHTINGALE has been appointed chairman of Sheffield Steel Products, Limited. He joined the board as managing director in 1939 and later became deputy-chairman. Capt. W. M. Hungerford Pollen has been elected deputy-chairman, and Mr. J. T. Henry, who has spent all his business life in the service of the firm, has been made managing director. Mr. A. T. Forty and Mr. J. W. Hemmings, who have been associated with the company since its inception, have joined the board.

PERSONAL

MR. B. F. PETRE has been appointed a director of the Steel Corporation of Bengal, Limited, in place of Mr. K. C. Mahindra, resigned.

MR. WILLIAM WILKINSON WOOD has been elected Master of the Cutlers' Company, Sheffield, for the fourth time. He is a director of the Wardsend Steel Company, Limited, Sheffield.

MR. ARCHIBALD GRAHAM, who has held the position of foreman in the brassfoundry of the Shotts Iron Company, Limited, for the past 22 years, has retired. He was the recipient of a presentation from his fellow workmen at a recent gathering.

MR. PERCY REES has retired from his position as analytical chemist after 46 years in the laboratories of the Workington Iron & Steel Company, and has been presented with a wallet of notes to mark the occasion.

SECOND-LIEUT. IAN C. M. THOMPSON, who is reported missing in the Middle East, is the only son of Mr. and Mrs. G. Malcolm Thompson. He studied at the Middlesbrough Technical School for two years, taking his diploma as a general founder, and before the war was undergoing special training in Warwickshire preparatory to joining his father in the family business of Samuel Thompson & Company (Millfields), Limited, ironfounders, of Wolverhampton.

Will

LEWIS, D., deputy managing director of John Harper & Company, Limited, ironfounders, of Willenhall £23,246

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Barker's Foundry (Rochester), Bath Hard, Rochester, Kent—£500. W. P. and A. M. Barker.

Shalibane—Engineers, ironfounders, etc. £1,000. B. P. Holder, 65, South End Close, London, N.W.3, subscriber.

Frank Tippen & Sons, 90, Stratford Street, Coventry—General engineers, toolmakers, etc. £6,000. F. J. and M. K. Tippen.

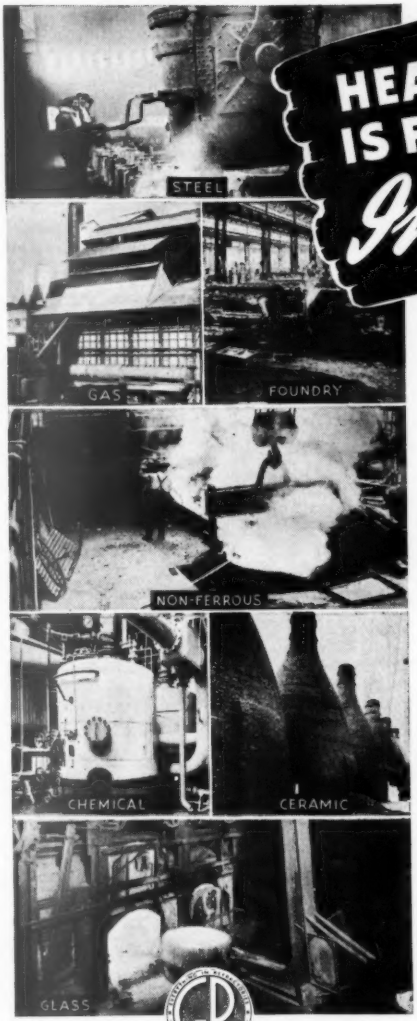
Timothy Parkes & Sons, Lawrence Lane, Old Hill, Staffs—Ironmasters, founders, steelmakers, engineers, etc. £2,000. J. and A. Shakespeare.

Thompson's Nechells, 38, Vesey Road, Sutton Coldfield, Warwickshire—Engineers, toolmakers, etc. £1,000. R. A. and G. A. Thompson.

Nugent Manufacturing Company, 19, Old Queen Street, London, S.W.1—Engineers, toolmakers, etc. £1,000. W., N., E. L. and J. Nugent.

F. B. Manufacturing Company, 21, Warwick Grove, Clapton, London, E.5—Engineers, toolmakers, metal and alloy makers, etc. £500. F. Boyd.

K. Medley & Company (Engineers), 5, Bond Street, Bradford, Yorks—To take over a business carried on at Chapel Green Works, Little Horton, Bradford, as "Knowles Medley & Company." £2,000. G. E. Dodd and W. Matthews.



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P. 153

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Raw Material Markets

IRON AND STEEL

Some further light on the plans of the Government for the concentration of the ironfoundry industry was thrown on Friday in the House of Commons. The President of the Board of Trade said that concentration was taking place by regions, and that the industry would have an opportunity to express their views before any scheme was put into force in a region. With regard to the position of Scottish foundries, he could give no unqualified assurances at present, but he understood that all the labour likely to be released under the Scottish scheme should be absorbed by other sections of the Scottish iron and steel industry.

The concentration scheme will, of course, be directed to the light-foundry section, which, except in a few instances, is unable to operate on a full-time basis. This branch is not sharing at all fully in the war contracts which are being handed out to the heavy foundries by the various Government departments, and business in other directions has dwindled considerably owing to restrictions on the use of materials and man-power and the necessity for conserving shipping tonnage. The demand for castings in connection with munitions, tank construction, etc., is insistent, and makers' order-books are filled over some time to come. Foundrymen are getting adequate supplies of iron, but in the case of the heavy foundries it has been necessary to utilise larger tonnages of high-phosphorus iron, refined iron and steel scrap, as the normal quantities of low-phosphorus iron and hematite are no longer available.

Consumers of foundry coke are well situated, especially the larger users who have ample storage accommodation, as they have been given the opportunity to accumulate substantial reserve stocks during the past few months. Small buyers are also receiving satisfactory week-to-week deliveries. The current price of Durham best foundry coke is 69s. 3d. per ton, delivered Birmingham and Black Country stations, this figure being fixed by the Control authorities.

Government orders for structural steel are quite considerable, and light and medium sizes of joists, angles, etc., are in good demand, order-books being filled over a lengthy period. Plates, too, are promptly taken up by the heavy trades, demand from the shipyards being especially insistent. Service requirements are absorbing large tonnages of sheets, and makers are busier. Alloy and special qualities of steel are in urgent demand, and production is being expanded where possible.

A feature of the scrap iron and steel market is the glut of the inferior grades. Steelworks and foundries are displaying little interest in these qualities, and their disposal is a problem. No doubt in time there will be a ready demand for this material, and the big tonnages of railings, gates, etc., will be really useful to scrap consumers. Supplies of better descriptions of scrap are being absorbed freely, and larger deliveries would be appreciated by many consumers.

NON-FERROUS METALS

The copper position continues to be satisfactory, insofar that all essential requirements are being steadily satisfied, while fresh arrivals would appear to be maintained. It is evident that reserve stocks are on hand in this country, although their extent, of course, is not known outside official quarters. Supplies of copper hinge to a large extent on the shipping position, and although this unquestionably is still serious, there are indications that the peak period of losses may have been reached, if the trend has not been actually reversed. Plans for further economy in the use of copper are being introduced in the United States.

Production of domestic tin on the other side of the Atlantic is reported to be improving. A campaign designed to recover 10,000 tons of tin per annum from old cans has been started. In the next twelve months it is hoped that 500,000 tons of tin cans will have been accumulated, of which 315,000 tons will be sent to detinning plants, while the remainder will be stored until May, 1943, when six more detinning plants are likely to be ready to come into operation.

Reports of progress at tin mines in Cornwall have been less satisfactory of late. Apparently the number of men released from the Forces to return to the mines has not been sufficient to meet the labour shortage.

It is reported that the Ministry of Supply has reached agreement with the Nigerian tin producers on the basic price to be paid for tin concentrates. As yet, the actual price has not been disclosed, but it is understood that it is on a f.o.b. basis. It is thought in some circles that the price may be in the region of £265 per ton, and roughly equal to the Ministry's selling price of £275, less an allowance of somewhere around £10 for shipping and insurance charges. The Ministry of Supply has taken over the whole production of the tinfields of Nigeria, which last year was about 14,000 tons. Producers have been requested to expand their outputs to the fullest possible extent. The incidence of E.P.T. remains a sore point among Nigerian producers and on their short-lived mines the present rate constitutes something of a crushing capital levy. They feel that they are not receiving commensurate payment for their wasting assets, although they are, in effect, gutting their mines in order to satisfy the requirements of the war effort of the United Nations.

Spelter is being used extensively in the war factories and consumption is so large that deliveries to other than priority consumers have been reduced to very small proportions. While supplies of zinc are undoubtedly tight, it is not thought that there is an acute shortage, and supplies should continue to be sufficient to meet vital needs. The Control authorities are eager to conserve supplies as a precaution against future requirements, so that it is unlikely that there will be any relaxation of conditions relating to deliveries.

Supplies of lead are also strictly controlled, but there are ample tonnages to meet essential needs.

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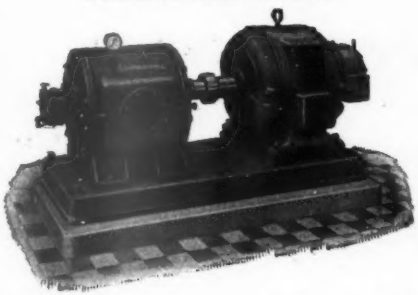

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